Energy, Mines and Resources Canada | Énergie, Mines et Ressources Canada

CANMET

Canada Centre for Mineral and Energy Technology | Centre canadien de la technologie des minéraux et de l'énergie

CBCRL'S RESPIRABLE DUST RESEARCH PROGRAM DECEMBER 1984

C.Y. Hwang and D.B. Stewart
Cape Breton Coal Research Laboratory

December 1984

9 pp

MICROMEDIA
FEB 27 1985

ENERGY RESEARCH PROGRAM
COAL RESEARCH LABORATORIES
DIVISION REPORT ERP/CRL 84-58(TR)

CBCRL'S RESPIRABLE DUST RESEARCH PROGRAM
DECEMBER 1984

by

C.Y. Hwang* and D.B. Stewart**

SUMMARY

Respirable dust research pr m of CANMET's Cape Breton Coal Research Laboratory is described. The long term objective is to lower occupational exposure to respirable dust and thus reduce risk of the development and progression of pulmonary disease in coal miners. The program which includes in-house and contract research activities, places main emphasis on field data collection and laboratory analysis. The importance of effective planning of dust sampling and support from mine operators and miners is discussed.

---

*Research Scientist and **Manager, Cape Breton Coal Research Laboratory, CRL, CANMET, Energy, Mines and Resources Canada, Sydney.

PROGRAMME DE RECHERCHE DU LRCCB SUR LA POUSSIÈRE INHALABLE
DÉCEMBRE 1984

par

C.Y. Hwang* et D.B. Stewart**

RÉSUMÉ

Le rapport donne une description du programme de recherche du Laboratoire de recherche sur le charbon du Cap-Breton sur la poussière inhalable dont l'objectif à long terme est de réduire le temps d'exposition à la poussière et ainsi de diminuer les risques de cancer du poumon chez les travailleurs des mines de charbon souterraines. Le programme qui comprend des activités de recherche interne et par impartition accorde une importance primordiale à la collecte des données sur le terrain et aux analyses en laboratoire. Le rapport présente un exposé sur l'importance de la planification efficace des méthodes d'échantillonnage de la poussière et sur l'appui reçu des exploitants et des travailleurs des mines souterraines de charbon.

---

*Chercheur scientifique et, **Gestionnaire, Laboratoire de recherche sur le charbon du Cap-Breton, LRC, CANMET, Énergie, Mines et Ressources Canada, Sydney.

CONTENTS

	Page
SUMMARY	i
RÉSUMÉ	ii
INTRODUCTION	1
OBJECTIVE	1
RESEARCH PROGRAM	2
In-house	2
Contract	2
FIELD SAMPLING	2
Fixed Position Sampling	3
Personal Sampling	3
Sampling by SIMSLIN II	3
DISCUSSION	4

TABLE

No.		
1.	CBCRL dust research instrumentation	5

INTRODUCTION

In the past year CBCRL has focussed its dust research activity in three areas:

(a) a statistical review of compliance dust sampling results from the past decade,
(b) the acquisition of dust sampling instrumentation and associated laboratory equipment, and
(c) literature review.

Activities in the above areas are nearing completion and this document endeavours to establish the short and medium term objectives and projects of CBCRL's on-going dust research activity.

OBJECTIVE

The respirable dust research program of CBCRL is intended to improve the understanding and control of respirable dust at CBDC mines. It is hoped that improved understanding and control will result in lower occupational exposure to respirable dust and therefore reduced risk of the development and progression of pulmonary disease in coal miners.

In the short term CBCRL plans to:

(a) measure respirable and total dust concentrations at a variety of locations and conditions in CBDC mines,
(b) identify and quantify major dust sources in CBDC mines, and
(c) correlate longwall face worker's personal exposure to control point measurements.

In the medium term, the data base collected to achieve the short term objectives will be extended to improve statistical reliability and the efficiency of various dust control at source technologies will be investigated.

In the long term, it is hoped that CBCRL research will contribute to a reduction in coal mine worker exposure to airborne respirable dust.

RESEARCH PROGRAM

CBCRL's dust research program will include in-house and contract activities. Some projects will be laboratory based but on the whole the main emphasis will be placed on field data collection and laboratory analysis.

IN-HOUSE

During the past year CBCRL has acquired and ordered a comprehensive suite of dust related instrumentation. This instrumentation is listed in Table 1. Detailed work plans to accomplish specific objectives are under development. These work plans will be discussed in detail with CBDC prior to implementation.

Field sampling programs intended to address all three short term objectives are expected to begin before the end of the current financial year.

CONTRACT

Two research contracts are currently in place. Norwest Resource Consultants Ltd. have been awarded a contract to conduct a review of water infusion technology so that CBCRL can examine the practicality and viability of such techniques for dust control in the Sydney Coalfield. The Atlantic Coal Institute has been awarded a contract to develop a routine analytical procedure to determine the elemental and mineralogical constituents of filter paper borne respirable dust samples. Additional contracts will be considered to help meet the defined objectives.

FIELD SAMPLING

Accurate and comprehensive field sampling is central to CBCRL's dust research program. Accordingly, the following general sampling

procedures and methodology have been defined although it is recognized that variations and alternations will be necessary to accomplish specific objectives.

FIXED POSITION SAMPLING

Full-shift sampling at a fixed location provides information on respirable dust level averaged over a shift. The present surveys will determine the relationship between dust concentrations measured at different locations in each longwall section. Casella Gravimetric Samplers 113A will be installed at the following locations:

(a) intake outbye end of a longwall, and
(b) statutory dust control point.

Discussions with CBDC staff will identify the exact site of sampling and method of installing sampling systems.

PERSONAL SAMPLING

A personal sampling system (or sampler) consists of a cyclone connected to a portable pump by plastic tubing. Personal sampling provides information on individual dust exposure. In the present dust surveys, miners with nine specific job titles will be requested to participate in dust sampling. Personal sampling will be portal-to-portal or on-site and carried out on voluntary basis.

Personal samplers used in the present surveys can also be used for fix-position sampling after calibration to a standard Casella Gravimetric Sampler.

SAMPLING BY SIMSLIN II

SIMSLIN II monitoring system is a portable, self-contained instrument which used light-scattering to continuously record and read out the mass concentration of respirable airborne dust. It can also operate gravimetrically by weighing the back-up filter arrangement.

SIMLIN II will be set up at the statutory dust control point sidy-by-side with a standard Casella Gravimetric Sampler to monitor respirable dust. The results of shift-average measurement by the SIMSLIN will be compared to that measured by Casella 113A samplers at different locations.

The SIMSLIN II unit is very useful as a research tool to identify temporal variations and dynamic fluctuations in respirable dust concentrations in real time.

The ability of SIMSLIN II to continuously monitor dust concentration enables identification of events or coal-winning activities which created unusually high airborne dust concentrations if the operator(s) or investigator(s) observes, times and records the various activities.

SIMSLIN II will also be used to evaluate effectiveness of dust control measures (such as changes in coal cutting speed or use of different spray water pressure) under experimentally controlled working conditions by measuring the dust concentrations before and after a control measure is implemented.

DISCUSSION

Dust sampling programs in dynamic conditions such as those encountered in underground coal mines are expensive and time consuming. Replicate sampling is essential if statistically significant results are to be obtained. Successful programs require effective planning and support from mine operators and the general workforce. Such problems are not underestimated by CBCRL who hope through the preparation and dissemination of detailed work plans and information sessions to secure cooperation.

It is recognized that successful field sampling can only be accomplished with atleast tacit approval by all parties involved.

Table 1 - CBCRL dust research instrumentation

Instrument for Dust Surveys	Number of Units
SIMSLIN II Dust Monitoring System	1
Casella Gravimetric Sampler 113A	4
Personal Samplers:	
Casella Cyclone + DuPont Pump P2500A	9
Personal Samplers:	
Nylone Cyclone + DuPont Pump P2500A	3
Personal Samplers:	
Nylone Cyclone + MSA Fixt-Flo Pump	3
CAHN Automatic Electrobalance C-29	1
Portable Anemometer AM5000	2
Sling Psychrometer	2